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ARMY ENGINEER SCHOOL FORT BELVOIR VA  
8-MAN SQUAD ANALYSIS OF ARTEP 5-145.(U)  
JAN 77 C ELLIOTT, B CREEL, D BUSH, M PELL

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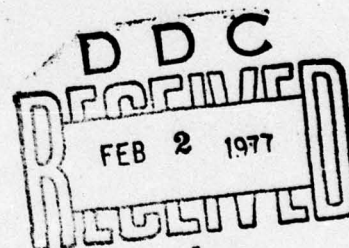
8-MAN SQUAD ANALYSIS  
OF ARTEP 5-145

Final Draft

DEPARTMENT OF THE ARMY  
Headquarters United States Army Training and Doctrine Command  
Fort Monroe, Virginia 23651

UNITED STATES ARMY ENGINEER SCHOOL  
FORT BELVOIR, VIRGINIA 22060

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UNITED STATES ARMY  
TRAINING AND DOCTRINE COMMAND

8 MAN SQUAD ANALYSIS  
OF ARTEP 5-145

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DRAFT

3 JANUARY 1977

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## NOTICES

### DISCLAIMER

The findings in this report are not to be constructed as an official position of the Department of the Army, U. S. Army Training and Doctrine Command or the U. S. Army Engineer School unless so designated by other authorized documents.



#### ACKNOWLEDGEMENT

This study was initiated and sponsored by the U. S. Army Engineer School. It is part of the Combat and Training Developments Special Studies Project.

The conclusions and recommendations of this study are those of the study team. They are based on data gathered and analyzed by the members of the team, assisted by personnel of the Combat and Training Developments Directorate.

The group of students from the Engineer Officer Advance Class 501-7T (EOAC) included 1LT Donald C. Bush, CPT Cliff Elliott, and CPT Buckner M. Creel, IV. Project monitor for the Concepts and Studies Division, DC/CTD was Mr. Mark Pell.

# ABSTRACT

↙ The 8 man squad analysis of ARTEP 5-145 is a project conducted by a group of students from the Engineer Officer Advance Course, 501-7T as part of the Combat and Training Developments Special Studies Project.

The study examined the tasks and sub-tasks of the Army Training and Evaluation Program (ARTEP) in the Mechanized/Armored Division Engineer Battalion to determine the impact of reducing squad strength to eight men on task performance.

Findings are based on comparison of expected squad performance versus the present task standard for a 10 man squad. Analysis used the appropriate field and technical manuals to develop the comparisons where possible.

Comparison and analysis of tasks led to suggested revisions of the squad level ARTEP as well as identification of areas for operational field testing to develop revised standards. ↗

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## MAIN REPORT

### INTRODUCTION:

1. Background - In June 1976, the Division Restructuring Study proposed a new configuration of the Mechanized/Armored Engineer Battalion. This restructuring resulted in reducing the squad strength from 10 to 8 men. A tentative TOE 5-835T was prepared and submitted to TRADOC to reflect these changes; however, an analysis of the ARTEP tasks were not made prior to submission of the TOE 5-835T. This analysis was conducted as part of the Engineer Advanced Course Special Studies Program. Study Directives are shown at Appendix A.

2. Purpose - To analytically determine which ARTEP 5-145 Squad tasks can be performed by an 8-man Engineer Squad, which tasks cannot be performed by an 8-man squad, and which tasks can be performed marginally with the 8-man squad.

3. Assumptions:

a. The capabilities of the individual soldier to reach the training levels required to perform his portion of the squad's task will continue through 1980 at the same levels as existed when the standards for task accomplishment in ARTEP 5-145 were developed.

b. The tactical doctrine and maneuver concepts will continue to require Engineer support consisting of the types of tasks outlined in ARTEP 5-145; no drastic revision of engineer support will occur in the near future.

c. Certain tasks are labor intensive, and their performance is constrained by manual labor. A task identified as labor intensive will experience a change in completion time as the work force is increased

or decreased in size.

e. The task completion standards and structuring contained in current DA Publications are quantitatively correct and based upon valid work measurement concepts and methods.

4. Objectives:

a. Develop suggested revisions to the ARTEP for possible inclusion in future editions.

b. Develop suggested revision to the tentative TOE 5-835T for possible inclusion in future changes.

c. Identify squad tasks requiring an operational field test to determine the 8-man squad capability for task completion.

5. Methodology:

a. The study group initially reviewed the current TRADOC literature to insure a common level of understanding of the doctrine on Engineer employment. (See Reading List at Appendix I) The group then individually examined the Squad Task Inventory, ARTEP 5-145, to select general areas for further consideration (See Appendix K). Each Essential Element of Analysis (See Appendix B) was then taken individually, and the ARTEP tasks were examined in detail to determine which, if any, fit that category. Those tasks requiring changes were extracted and analyzed to determine the nature of the change. If possible, suggested revisions were developed, based on current doctrine. In those cases where a supported revision could not be developed, recommendation for further testing or qualitative suggestions were made.

b. A conscious effort was made to evaluate the tasks objectively. The group members were aware that their past experiences and preferences would color the conclusions they drew from the analysis process; accordingly, each carefully scrutinized the work of the others to insure that this impact was minimized.



c. Although the group was small, it contained a wide variety of experience in CONUS and USAREUR Engineer units. All group members had experience in performing missions with reduced strength squads, and were familiar with the types of problems which could be encountered. In those areas where the group felt its experience would not give a thorough analysis, outside experience was sought. This technique proved particularly effective for the analysis in a possible Mid East Scenario (See Appendix F).

d. We feel that these methods are valid within the scope of the study and the time available for the effort. To the best of our knowledge, the findings are consistent with current tactical doctrine as expressed by the Engineer School and the current Army literature.

6. Findings: The specific findings are outlined as Appendices C through H. The format of these appendices follows that of the EEA, and shows the specific tasks and changes/recommendations for each.

a. Overall, the group found that the number of tasks requiring a change of any type was relatively small. Contributing factors to this finding are:

(1) The standards for task completion are relatively loose, and often written in qualitative terms ("finish within mission limits given",) completion time dictated by tactical situation, etc. This finding partially invalidates the assumption at paragraph 3e above.

(2) In several instances, the study group knew that the ability of the 8-man squad to accomplish the task would be affected; however, no measure of this could be found and no change to the ARTEP was warranted.

(3) The majority of tasks are necessary for proper support, and will have to be accomplished for the success of the combined arms effort, regardless of squad size.



(4) The majority of tasks are not tied to particular systems or equipment types. As a result, these tasks are necessary and can be accomplished by present and projected equipment. This finding responds to EEA 5H.

(5) With the exception of size problems, the DRS has not affected the mission of the combat engineer squad. More importantly, the re-equipping and restructuring of the battalion, company and platoon has made little impact upon the expected missions or work methods of the squad.

(6) Although not directly related to ARTEP analysis, a major concern of the study group was the impact of the DRS by removing the assistant squad leader (Sgt E-5) from the squad structure. The assistant squad leader presently provides the following benefits in task accomplishment:

(a) When the squad leader cannot be present (absence, illness, casualty, etc) a knowledgeable man with the required supervisory skills is present to take charge of the squad.

(b) When it is necessary to break the squad into two work groups, a man with the required supervisory skills can take charge of that second work group.

(c) When it is necessary for the squad leader to leave the job site to coordinate or arrange for materials, a qualified individual can insure that the work continues to proceed smoothly.

(d) There is another individual with similar skills to aid the squad leader in planning job accomplishment. The skills removed by the deletion of the assistant squad leader can not be replaced by the senior demolition specialist (Spec 5 - E-5). The impact on the ability of the squad to accomplish tasks is definitely affected. This sub-paragraph responds to

the study objective listed at paragraph 4b. Future revisions of tentative TOE 5-835T should consider providing MOS skills in the 8-man squad which would be comparable to the assistant squad leader (Sgt E-5).

(7) The following squad tasks identified in Appendix E and discussed in Appendix G would be appropriate for an operational field test. This sub-paragraph responds to the study objective listed at paragraph 4c.

<u>ARTEP TASK NO.</u>	<u>TASK DESCRIPTION</u>
4-13	SECURE WORK SITE
6-21	EMPLACE NON-EXPLOSIVE ANTI-VEHICULAR OBSTACLES
6-34	ESTABLISH A MINE DUMP
6-45	INSTALL ROW MINEFIELD WITH M-57 MINE DISPENSER
7-4	CONDUCT ROUTE SWEEPS
7-5	CONDUCT HASTY MINEFIELD BREACH
8-6	CONSTRUCT M4T6 FIXED SPANS
8-7	EMPLACE M4T6 FIXED SPANS
11-6	CONDUCT AMBUSH PATROL

7. CONCLUSIONS:

a. Generally, the 8-man squad was found to be in need of the leadership that was lost when the assistant squad leader position was deleted.

b. Additional time was needed to perform a number of labor intensive tasks because of a 20% reduction in work force in the squad.



APPENDIX A

SPECIAL STUDIES PROJECT

DIVISION: Organization Division

PROJECT TITLE: Eight - Man Squad Analysis of ARTEP 5-145

CLASS: EOAC 501-7T

PROJECT OFFICER: CPT Wolf

PHONE: 43826

BACKUP PROJECT OFFICER: Mr. M. Pell, CSD

PHONE: 43122

GENERAL DESCRIPTION OF THE TYPE OF REQUIRED STUDENT EFFORT:

a. Analysis of tasks in ARTEP 5-145 which are applicable to the new engineer battalion, heavy division (TOE 5-835T) to determine if an 8 - man squad can accomplish those tasks. If not, determine if method of accomplishment can be altered to conform to the smaller squad configuration.

b. Final report should state those tasks which can be accomplished, those which would be marginal and those which cannot be accomplished with recommendations on the latter two.

c. Three students could accomplish this task.

MANNER AND TIME FRAME IN WHICH PRODUCT WILL BE USED:

A tentative TOE 5-835T is being prepared for submission by 30 Sep 76. The ARTEP analysis was not made prior to submission for lack of resources and time. Upon completion, results of this analysis will immediately be incorporated by change to the TTOE as necessary.

BACKGROUND OF PROJECT:

Development of TTOE for an engineer battalion to support the restructured heavy division was directed to be complete in 45 days. Various parameters of the battalion including total strength and the squad size were dictated. There was not time during TTOE development to determine if the 8-man squad could, in fact, perform all required tasks. That must now be accomplished after the fact.

STUDENT EXPERIENCE: (Most useful)

Platoon leader experience, particularly in armored engineer units.

GENERAL COMMENTS:



SUBJECT: Eight-Man Squad Analysis of ARTEP 5-145

1. PURPOSE: To analytically determine which ARTEP 5-145 squad tasks can be performed by an 8-man engineer squad, which tasks cannot be performed by an 8-man squad, and which tasks can be performed marginally with the 8-man squad.
2. USE OF STUDENT PRODUCT: A Tentative TOE 5-835T has been prepared and submitted to TRADOC for the Engineer organization of the Heavy Division. An ARTEP analysis was not made of the 8-man squad capabilities prior to submission of the TTOE. Results of this analysis will be incorporated into the TTOE by change. The results of the analysis will also be used to identify those squad tasks which require an operational field test to determine squad capability.
3. SCOPE: This project will only examine squad tasks in the ARTEP 5-145 and will exclude tasks associated with capabilities which have been deleted from the division engineer battalion by the AIME and DRS study efforts..
4. TIME FRAME: Current and 1980+.
5. ESSENTIAL ELEMENTS OF ANALYSIS (EEA).
  - a. Which ARTEP tasks are considered non-essential in the FM 100-5 environment?
  - b. Which of the remaining ARTEP tasks cannot be performed by the 8-man engineer squad?
  - c. Which of the ARTEP tasks can be performed only marginally by the 8 man squad?
  - d. Which of the tasks developed in response to 5b and 5c are most critical in a European environment and which are most critical in a Middle East environment?
  - e. Which tasks in 5b and 5c could be performed by the 8-man squad if the task were re-engineered or the battle drill changed to fit the 8-man squad?
  - f. Which tasks in 5b and 5c cannot be performed by the 8-man squad due to lack of required skills in the 8-man squad.
  - g. For those tasks listed in 5e and 5f what is the recommended solution for task accomplishment?
  - h. Which tasks could be performed in 1980+ with new equipment but cannot be performed with current equipment?

6. SEMINAR SCHEDULE: See Inclosure 1.

7. REPORT OF STUDENT EFFORT: The student group should produce a report which documents the efforts of the students on this project. The report should use TRADOC Pam 71-3 as a guide to content. Time constraints may limit the detail of the report. However the report should be complete enough to describe the analysis made, methodology used, response to the EEA, and results of the analysis.

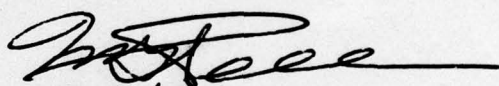
8. REFERENCES:

- a. DRS guidance documents.(To be provided by Project Officer).
- b. FM 100-5, Operations.
- c. TTOE 5-835T, Engineer Battalion, Heavy Division.
- d. ARTEP 5-145.

9. Project Officers:

- a. Primary: CPT WOLF, ORGANIZATION DIVISION, X43826.
- b. Alternate: MR. PELL, CONCEPTS AND STUDIES DIVISION, X 41870.

10. CORRELATION: ACN 22957, Support to USAES Academic Instruction.

  
M. G. PELL

Alternate Project Officer



TENTATIVE SCHEDULE

8-Man Engineer Squad Analysis.

EVENT

TARGET DATE

Orientation by D/CD and Project Officers	19 Oct 76
First Meeting	29 Oct 76
Complete reading and review of references	29 Oct 76
Complete lists in response to EEA 5a, 5b, and 5c	26 Nov 76
Complete lists in response to EEA 5d, 5e, and 5f	30 Dec 76
Complete response to EEA 5g, and 5h.	10 Dec 76
Complete first draft of report	17 Dec 76
Prepare drafts of briefing graphics	17 Dec 76
Dry run briefing of project	30 Dec 76
Present briefing of project	1st week in Jan 77
Final draft of report completed	1st week in Jan 77

Incl 1



## APPENDIX B

### ESSENTIAL ELEMENTS OF ANALYSIS (EEA)

- a. Which ARTEP tasks are considered non-essential in the FM 100-5 environment? (See Appendix C)
- b. Which of the remaining ARTEP tasks cannot be performed by the 8-man engineer squad? (See Appendix D)
- c. Which of the ARTEP tasks can be performed only marginally by the 8-man squad? (See Appendix E)
- d. Which of the tasks developed in response to 5b and 5c are most critical in European environment and which are most critical in a Middle East environment? (See Appendix F)
- e. Which tasks in 5b and 5c could be performed by the 8-man squad if the task were re-engineered or the battle drill changed to fit the 8-man squad? (See Appendix G)
- f. Which tasks in 5b and 5c cannot be performed by the 8-man squad due to the lack of required skills in the 8-man squad? (See Appendix H)
- g. For those tasks listed in 5f what is the recommended solution for task accomplishment? (See Appendix G)
- h. Which tasks could be performed in 1980 and with new equipment but cannot be performed with current equipment?

## APPENDIX C

ATSE-CD-CS

### 8 MAN SQUAD ANALYSIS

#### 1. Response to EEA 5a:

a. Following are the tasks in ARTEP 5-145 which are considered non-essential in the FM 100-5 environment:

#### CONDUCT SECURITY OPERATIONS

<u>Task No.</u>	<u>Description of Task</u>
4-25	Employ dismounted riot control formations.
4-26	Conduct civil disturbance patrols.

#### PROVIDE ENGINEER SUPPORT FOR BARRIER AND DEFENSIVE OPERATIONS

6-18	Construct barbed-wire entanglements.
6-48	Prepare and detonate atomic demolitions.

#### CONDUCT FIXED BRIDGING OPERATIONS

8-2	Construct timber bent abutment.
8-8	Layout Bailey Bridge.
8-16	Construct three rope bridge.

#### CONDUCT HORIZONTAL CONSTRUCTION OPERATIONS

13-22	Construct expedient culverts.
13-23	Construct expedient check dams.
13-24	Construct culvert using local materials.
13-25	Construct culvert headwalls.

b. A rationale for each task which is considered non-essential follows:

4-25 Employ dismounted riot control techniques.  
4-26 Conduct civil disturbance patrols.

RATIONALE - Neither of these tasks are essential in the FM 100-5 environment, and contribute nothing to the engineer squad's ability to give support to the forward units or to fight as infantry when required. Training in these two areas is best conducted on a mission oriented basis when unit contingency plans require this specialized knowledge. All armored/ mechanized division engineer squads do not need this training to accomplish their mission. Inclusion of these two tasks is contrary to the ARTEP guidelines and philosophy.

6-18 Construct barbed wire obstacles.

RATIONALE - We do not feel that barbed wire obstacles will play a significant role in the FM 100-5 environment for the following reasons:



a. Barbed wire obstacles have a negligible anti-tank value. (Par 6-1, FM 5-15).

b. As anti-personnel barriers only, they will have a very low priority in barrier planning in an armored/mechanized environment.

c. Erection time is time consuming relative to their value, with one exception (noted below).

d. A large amount of materials are required to make an effective wire obstacle. We do not feel that transport will be available to carry these materials in addition to the supplies and munitions required by anti-tank weapons and obstacles.

Accordingly the use of barbed wire obstacles should be de-emphasized with the exception of the General Purpose Barbed Tape Obstacle (GPBTO), in barrier planning. The GPBTO is a lightweight obstacle requiring 1/30 to 1/60 of the construction time of similar standard wire obstacles. (Table 4-7 (rev), FM 5-34). Where local anti-personnel protection is required, such as around command posts and high security areas, we recommend employment of the GPBTO. Training in other forms of barbed wire obstacles should assume a low priority.

6-48 Prepare and detonate atomic demolitions.

RATIONALE - Tentative TOE 5-835T, Engineer Battalion, Heavy Division, has removed the ADM platoon from the Armored/Mechanized Division Engineer Battalion. This task cannot be performed by any assigned unit under that TOE and should be removed from the ARTEP.

#### 8. CONDUCT FIXED BRIDGE OPERATIONS.

RATIONALE - The engineer squad in the FM 100-5 environment must be as mobile as the maneuver elements. Its mobility must allow for continuous support of tank elements and ground troops. This concept dictates limited support of the engineer squad in fixed bridge operations. Installation time requirements and quick reaction time (24 hours) in obtaining bridging materials are key factors in considering the significance and role of fixed bridges on the modern battlefield. Maneuver elements which need to cross gaps require engineer bridge support within a few hours. The engineer squad must be able to reinforce existing bridges on roads to support continual traffic loads and to prepare by-passes of obstacles which will allow the maneuver element to move. To support the tank elements and ground troops on the modern battlefield the engineer squads' support in fixed bridge operations should be geared to:

a. reinforcing existing bridges on primary routes to allow safe passage of maneuver elements.

b. preparation of suitable by-passes where fixed bridge support is normally required.

Tasks below are considered non-essential for the reasons given.



8-2 Construct Timber Bent Abutment.

RATIONALE - This task requires the engineer squad to construct a timber bent abutment for a single lane bridge within 7 hours that will provide support to continual traffic loads.

a. The task involves the construction of a timber trestle bridge or other fixed bridge which requires platoon and company efforts. This task cannot be a sole squad effort but a combined effort engineered at platoon/company level.

b. Construction time requirement for an 8-man squad would exceed 8-10 hours. This type effort is not compatible with a force moving rapidly on the modern battlefield. Gaps encountered by the maneuver element must be negotiated rapidly; therefore the squad efforts should be directed toward preparing a by-pass of wide gaps in main routes. Corps engineer forces will subsequently prepare abutments for bridges.

8-8 Layout Bailey Bridge.

RATIONALE - This task requires the engineer squad to layout a panel bridge site within 1 hour that will permit the construction of a panel bridge. (Ref TM 5-277).

a. The tasks involve the construction of a Bailey bridge which requires platoon effort. Site layout and center line siting by the platoon leader is essential. The squad should perform the Bailey bridge layout as a sub-task of the platoon.

b. On the modern battlefield the engineer squad will be far in advance of the area where time and material availability will allow for panel bridge construction.

c. Reporting to next higher command the location of sites for panel bridges as a part of engineer reconnaissance should continue as a function of the engineer squad.

8-16 Construct Three-Rope Bridge.

RATIONALE - This task requires the engineer squad to construct a three rope bridge across a gap of 30 meters within 3 hours utilizing man-made anchorages. The tasks allude to crossing foot soldiers over the rope bridge which is not likely in an armored unit on the modern battlefield. FM 100-5 Operations, stresses movement across the battlefield in tanks or APCs.

13-22 Construct Expedient Culverts

13-23 Construct expedient check dams

13-24 Construct culverts using local materials

13-25 Construct culvert headwalls

RATIONALE - In the environment of the modern battlefield, the construction of culverts, expedient or otherwise, will not concern the line engineer squad of the division engineer battalion. There are several reasons for the lack of priority put on constructing culverts and check dams. In the modern battlefield, time is of critical importance. If possible the maneuver unit will by-pass an area where culverts would be necessary. The combat engineer squad does not have to maintain the MSR for maneuver units. This will be performed by Corps Engineer units. If the situation requires a road through an area, a hasty road will be built with little thought to the drainage pattern and constructing culverts. The modern battlefield will be highly fluid with emphasis on speed of movement. The division engineer squad will do as little as necessary to maintain movement of the maneuver unit, then will move to the next high priority task leaving the polishing and finishing touches to the engineers at Corps level.

The Division Engineer line squad will do very little permanent type work as far as roads are concerned. These tasks are not considered essential for a division engineer line squad in an armored/mechanized division on the modern battlefield.



APPENDIX D

ATSE-CD-CS

8-MAN SQUAD ANALYSIS

1. Response to EEA 5b.

Which of the essential tasks in ARTEP 5-145 cannot be performed by the 8-man squad.

NONE



## APPENDIX E

ATSE-CD-CS

### 8-MAN SQUAD ANALYSIS

#### 1. Response to EEA 5c.

a. The following ARTEP 5-145 tasks can be performed only marginally by the 8-man squad.

(1) 4-13 - Secure Worksite.

COMMENT: No formal change but will include comment.

(2) 6-8 - Assist in construction and/or emplacement of obstacles.

COMMENT: No formal change but will include comment.

(3) 6-21 - Emplace non-explosive anti-vehicular obstacles.

COMMENT: Formal change on subtask abatis.

(4) 6-34 - Establish a mine dump.

COMMENT: Formal change on M-57 mine dump.  
Assembly line has to be modified.

- (5) 6-39 - Conduct marking operations for defensive/barrier minefields.  
6-40 - Conduct siting operations for defensive/barrier minefields.  
6-41 - Conduct recording operations for defensive/barrier minefields.  
6-42 - Conduct laying operations for defensive/barrier minefields.

COMMENT: No formal change but comment concerning demo specialist.

(6) 6-45 - Install row minefield using M-57 mine dispenser.

COMMENT: Formal change.

(7) 6-46 - Install AP mines in a field layed by M-57 mine dispenser.

COMMENT: No formal change but comment included.

(8) 7-4 - Conduct route sweeps.

~~7-5~~ Conduct a hasty minefield breach.

COMMENT: No formal change but comment on battle drill and time.

(9) 7-11 - Assist in the assault of fortified positions.

COMMENT: No formal change but comment

- (10) 8-6 - Construct M4T6 fixed spans.  
8-7 - Erplace M4TC fixed span.

COMMENT: Formal change on time and organization.

- (11) 9-5 - Support assault elements in river crossing operations.

COMMENT: No formal change but comment on capacity.

- (12) 11-6 - Conduct an ambush patrol.

COMMENT: No formal change but comment on less firepower.

- (13) 13-4 - Clear and grub site by hand.

COMMENT: No formal change but comment on time to perform.



## APPENDIX F

### Response to EEA 5d

1. All tasks listed in EEA 5c are critical in a European environment.

A squad which is to function at a combat-ready level in a European Scenario must be capable of performing all of these tasks.

2. The following tasks are not critical in a Mid-East environment:

a. 6-34 - Establish mine dump (Including one for the M-57 mine planter)

6-45 - Install row minefield using M-57 mine dispenser

6-46 - Install AP mines in a field layed by M-57 mine dispenser

Conversation with Major David Sinai, Exchange student from the Israeli Army, indicates that the terrain he is familiar with, and which is of highest interest to his nation's defense, is not suitable for use of the M-57 mine dispenser. The Golan Heights area consists of large rock fields and lava formations; the Sinai area is sandy desert. Current doctrine, as well as his own experience, indicates that the plow of the M-57 will not function as designed in similar areas. Off-road movement of all types is more restricted in both areas. Finally, the shifting sands of the Sinai make accurate and effective mine employment a complicated operation.

b. 6-21 - Subtask: ~~Construct~~<sup>construct</sup> Abatis. Current US doctrine indicates that trees of 24-inch diameter are required for antitank abatis. Few areas in the Mid-East have trees of this size in a sufficient density to be an effective obstacle. The opportunities to employ this type of obstacle are quite limited.

3. All tasks not listed in 2 above are considered critical in a Mid-East environment.



APPENDIX G

8-MAN SQUAD ANALYSIS

1. Response to EEA 5e. The following ARTEP 5-145 tasks identified in response to EEA 5c could be performed by the 8-man squad if the tasks were re-engineered or the battle drill changed to fit the 8-man squad. The discussion following each task is designed to satisfy EEA 5g.

a. 4-13 - Secure Worksite

We feel that the 8-man squad's ability to perform this task will be affected, although no quantitative figures are given in the task standard will consist of 2 men, normally centered around the squad's APC. A two-man OP will reduce the effective work force to 6. Additionally, the volume of fire delivered by the 8-man squad is presumed to be smaller than that volume delivered by the present squad, which raises additional questions concerning the 8-man squad's ability to perform this task.

Although no recommendations are made to change this task, the following should be considered:

(1) The tasks of the re-organized Engineer battalion should examine the effectiveness of the 8-man squad in performing engineer tasks while responsible for its own security, and the manner in which the security should be provided.

(2) This potential problem area should also be examined at the platoon level, as we feel the same comments are generally applicable to the re-organized platoon.

Both of these areas are outside the scope of this study.

b. Task 6-8 - Assist in construction and/or emplacement of obstacles.

Concerning sub-task - "Assist tactical elements." Under the 8-man squad concept there will be only one NCO. The squad will no longer have the experience of an assistant squad leader, 12B40 MOS. This lack of technical expertise and supervisory capability will diminish the capability of the squad to render assistance of a technical nature. Generally, the SP4s and below will not have the necessary experience to provide technical assistance.

c. Task 6-21 - Emplace Non-Explosive Anti-Vehicular Obstacles.

The emplacement of non-explosive anti-vehicular obstacles under ARTEP 5-145 include (1) construction of log obstacles and (2) construction of an abatis. The time required to complete these tasks must be adjusted for the 8-man squad.

(1) Construct log obstacles. This task requires the engineer squad to construct a rectangular or triangular log crib, 3 feet high, across a two-lane unsurfaced road within 4 hours using platoon front leader and hand tools. The time requirement here should be aligned with modified times specified in changes to FM 5-34, which indicate 4 to 8 squad hours to complete this task. Further modification of time required is necessary when this task is adjusted for the 8-man squad (5-10 hours).

(2) Construct Abatis. This task requires the engineer squad to construct an abatis, 75 meters in depth using trees at least 17 inches in diameter within 4 hours using explosives, 6 hours with one chain saw or 18 hours using squad pioneer tools. This task using squad hand-tools requires time modification. An increase of time by 20% should be made for the 8-man squad to 22-24 squad hours.

d. Task 6-34 - Establish a mine dump. With the current drill more than one 8-man squad is needed to man the conveyor unpacking and assembling M-15 mines, a re-engineered conveyor outline is given below:

ONE LINE ONLY

_____	1
_____	
_____	
_____	
_____	
_____	
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SQD LDR



- (1) Unload and place mine box on conveyor
  - (2) Open box, remove fuze can and place on top of mine
  - (3) Open fuze can, place fuze (with clip) in corner of mine box  
     Remove mine from box, remove handles from mine  
     Remove arming plug, place on top of mine
  - (4) Remove fuze from box, remove safety clip from fuze, and install fuze, remove box from conveyor
  - (5) Replace arming plug finger - Tighten arming plug with wrench.
  - (6) Unload conveyor load container
  - (7) Supervise and inspect fuzing
  - (8) Truck driver or help load or security.
- (e) Task 6-39 - Conduct Marking Operations for Defensive/Barrier Minefields.
- Task 6-40 - Conduct siting operations.
- Task 6-41 - Conduct recording operations
- Task 6-42 - Conduct laying operations

Procedures for laying a standard pattern minefield will have to be modified because of the lack of NCOs in the platoon. According to FM 5-34 and FM 20-32 a total of seven NCOs are needed. Since the assistant squad leader position has been deleted some parties will not have an NCO as a supervisor. If a fewer number of NCOs are used, additional time will be needed to complete the task.

(f) Task 6-45 - Install row minefield using M-57 mine dispenser. The squad can still perform the task but laying M-15 mines at a sustained rate of at least 380 mines per hour is a platoon standard not a squad standard. The time and rate element should be taken up on platoon level consideration. The squad can still perform its mission but it will take additional effort on all squads part.

(g) Task 6-46 - Install AP mines in a field layed by M-57 mine dispensers.

AP mines can still be installed in a field laid by the M-57 mine dispenser. According to the training evaluation standard, the AP mines are installed at the rate of 2 mines per hour. A squad with only eight men will have a reduced installing capability.



(h) Task 7-4 - Conduct Route Sweep.

Figure 3-26, FM 5-34 (Engineer Field Data) shows the organization for route clearing parties. All sub-parties are composed of one (1) NCO and eight (8) men. From experience, we know that this corresponds to the squad organization, with one (1) man detached to drive the squad vehicle. The present party is composed of 2 pullers, 2 probes, 2 markers, and 2 detector men, supervised by one (1) NCO.

We subjectively feel that this task can be performed by the 8-man squad; as the standard is loosely written, no change in the ARTEP is necessary. We suggest, however, that a test be performed to verify this.

(i) Task 7-5 - Conduct a Hasty Minefield Breach.

Table 3-7, FM 5-34 (Engineer Field Data) shows the pattern organization for manual breaching. Each squad is expected to provide an 8-man breaching party, which the re-organized squad could provide if its vehicle is left unattended.

We subjectively feel that the breaching party can consist of seven (7) men, by eliminating the reserve man; however, we can not support a detailed recommendation. We recommend that:

(a) The conduct of breaching operations at both the squad and platoon level be evaluated for possible change in party organization.

(b) The manhours figures in Table 3-6, FM 5-34, be re-evaluated for possible change in light of the new squad organization.

(j) Task 7-11 - Assist in the Assault of Fortified Positions.

The 8-man squad can provide limited assistance in the assault of fortified positions to tactical elements. The primary members of the squad who can actually give the expertise and support to assault elements are the squad leader and demolition specialist. The time required to accomplish assistance tasks (to include clearing AP mines, marking lanes and gaps) would increase due to the reduction of manpower available and the expertise available in the 8-man squad. No assistant squad leader is designated in the 8-man squad.

(k) Task 8-6 - Construct M4T6 Fixed Spans

Task 8-7 - Emplace M4T6 Fixed Spans

Both tasks are similar in that they involve crossing a gap utilizing components of the M4T6 bridge set. The technique of crossing the gap is the difference. In order for the 8-man squad to reasonably accomplish this task, a time modification to the ARTEP 5-145 must be made. The present

standards of constructing a dry span with a 15 foot span length within 30 minutes; a 23 foot - 4 inch span length within 40 minutes; a 30 foot span length within 55 minutes or a 38 foot - 4 inch span length within 75 minutes must be modified for the 8-man squad. The modification of time should include: (1) Two less balk carriers/pinners than the squad normally has; (2) reorganization so that the critical part of the task receives the required effort (more manpower, etc.) to increase squad efficiency (outpost per manhour).

The recommended time modification is an increase in times specified by ARTEP 5-145 by 20% due to manpower loss in 8-man squad. The 8-man squad should follow an organization where more effort is placed on the critical part of task.

(l) Task 9-5 - Support Assault Elements in River Crossing Operations.

Sub-Task e, operate assault boats, indicates that the squad is expected, at training level 3, to provide 3 man crews to operate 15-man pneumatic assault boats. The re-organized squad can still accomplish this; however, it can provide only 2 crews, versus the 3 it could previously provide.

We recommend that planning factors for river crossing operations be amended to reflect the fact that it requires 3 platoons, instead of 2, to operate the 18 assault boats found in the division.

(m) Task 11-6 - Conduct an Ambush Patrol.

The 8-man squad has a reduced volume of five when compared with the present organization. A test should be conducted to determine the ability of the squad to perform this mission in its new configuration, and the effect of removing the assistant squad leader upon control during ambush operations.

(n) Task 13-4 - Clear and Grub Site by Hand.

The training evaluation standard of clearing and grubbing at the rate of 100 squad hours is not realistic in light of the information given in FM 5-34. Either the standard or FM 5-34 should be changed.



APPENDIX H

ATSE-CD-CS

8-MAN SQUAD ANALYSIS

1. Response to EEA 5f.

Tasks identified in response to EEA 5b and 5c which cannot be performed by the 8-man squad due to lack of required skills in the 8-man squad.

NONE



**APPENDIX I**

**READING LIST**

1. TRADOC pamphlet 71-3, Combat Developments Study Writing Guide, 1 May 74.
2. Army Training and Evaluation Program for Engineer Battalion Mechanized and Armor Division, ARTEP 5-145, September 1975.
3. Engineer Battalion Heavy Division, TTOE 5-835T, Draft Plan, October 1976.
4. Operations, FM 100-5, 1 July 1976.
5. Letter, AETSBEN, Headquarters, 3rd Infantry Division, Office of the Assistant Division Engineer, 6 April 1976, Subject: Barrier Target Estimation.

APPENDIX J

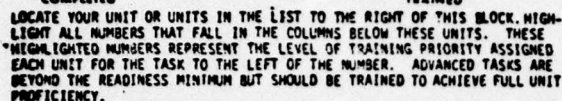
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The study examined the tasks and sub-tasks of the Army Training and Evaluation Program (ARTEP) in the Mechanized/Armored Division Engineer Battalion to determine the impact of reducing squad strength to 8-men on task performance. Findings are based on comparison of expected squad performance versus the present task standard for a 10-man squad. Analysis used the appropriate field and technical manuals to develop the comparisons where possible. Comparison and analysis of tasks led to suggested revisions of the squad level ARTEP as well as identification of areas for operational field testing to develop revised standards.		

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